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Artificial Intelligence Project--SRI and MIT Computation Center

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Machine Intelligence for MAN

by Timothy P. East

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MACRO Definitions for LISP

by Timothy P. Hart

In LISP 1.5 special forms are used for three logically separate purposes: a) to reach the alist, b) to allow functions to have an indefinite number of arguments, and c) to keep arguments from being evaluated.

New LISP interpreters can easily satisfy need (a) by making the alist a SPECIAL-type or APVAL-type entity. Uses (b) and (c) can be replaced by incorporating a MACRO instruction expander in define. I am proposing such an expander.

1. The property list of a macro instruction will have the indicator MACRO followed by a function of one argument, a form beginning with the macro's name, and whose value will replace the original form in all function definitions.

2. The function macro[1] will define macro's just as define[1] defines functions.

3. define will be modified to make macro expansions.

Examples:

1. The existing FEXPR csetq may be replaced by the macro definition:

```
MACRO ((  
  (CSETQ (LAMBDA (FORM) (LIST (QUOTE CSET)(LIST (QUOTE QUOTE)(CADR FORM))  
    (CADDR FORM))))  
))
```

2. A new macro stash will generate the form found frequently in PROG's:

x := cons[form;x]

using the macro stash, one might write instead of the above:

(STASH FORM X).

Stash may be defined by:

```
MACRO ((
(STASH (LAMBDA (FORM)(LIST (QUOTE SETQ) (CADDR FORM)(LIST (CONS (CADR FORM)
(CADDR FORM)))) )))
))
```

3. New macros may be defined in terms of old. enter is a macro for adding a new entry to the table (dotted pairs) stored as the value of a program variable.

```
enter[form] MACRO
is list[STASH;list[CONS;cadr[form];caddr[form]];
caddr[form]]
```

Incidentally, use of macros will alleviate the present difficulty resulting from the 90 LISP compiler's only knowing about those fexprs in existence at its birth.

The macro defining function macro[1] is easily defined:

```
macro[1] is deflist[1;MACRO]
```

The new define is a little harder:

```
define[1] is deflist[ndef[1];EXPR]
```

```
ndef[1] is [
```

```
atom[1]  $\rightarrow$  1;
```

```
eg[car[1];QUOTE]  $\rightarrow$  1;
```

```
member[car[1];(LAMBDA LABEL PROG)]  $\rightarrow$ 
```

```
cons[car[1];cons[cadr[1];ndef[caddr[1]]]];
```

```
get[car[1];MACRO] → mdef[get[car[1];MACRO]
[1]].
```

```
T → maplist[1;λ[[j];mdef[car[j]]]]
```

4. The macro for select illustrates the use of macros as a means of allowing functions of an arbitrary number of arguments:

```
select[form]MACRO ≡ λ[[g];
list[list[LAMBDA;list[g];cons[COND;
maplist[cadr[form];λ[[1];
[null][cdr[1]] → list[T;car[1]];
T → list[list[EQ;g;car[1]];cadr[1]]]]]
]];cadr[form]]][gensym[]]
```

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